Geometry Unit 9 Review

1. What is your name?

2. State the Pythagorean theorem.

If a triangle is right, $c^2 = a^2 + b^2$

3. State how you can tell if three segments can form a triangle.

Two shorter sides must sum to more than third side.

4. State the converse of the Pythagorean Theorem.

If $c^2 = a^2 + b^2$ the Δ is right.

$c^2 < a^2 + b^2$, the triangle is acute.

$c^2 > a^2 + b^2$, the triangle is obtuse.

5. State the formula for the 3 right triangle ratios.

$\sin \theta = \frac{opp}{hyp}$ $\tan \theta = \frac{opp}{adj.}$

$\cos \theta = \frac{adj}{hyp}$

6. State the formula for the magnitude of a vector.

$\vec{U} = \sqrt{x^2 + y^2}$

7. Compare and contrast parallel & equal vectors.

equal vectors have same magnitud & direction.

parallel have sam or opposite direction.

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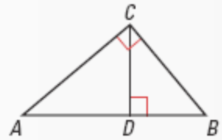
9.1 SIMILAR RIGHT TRIANGLES

Examples on pp. 528–530

EXAMPLES



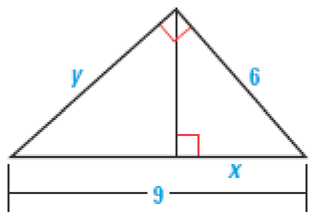
$\triangle ACB \sim \triangle CDB$, so $\frac{DB}{CB} = \frac{CB}{AB}$. CB is the geometric mean of DB and AB.

$\triangle ADC \sim \triangle ACB$, so $\frac{AD}{AC} = \frac{AC}{AB}$. AC is the geometric mean of AD and AB.

$\triangle CDB \sim \triangle ADC$, so $\frac{DA}{DC} = \frac{DC}{DB}$. DC is the geometric mean of DA and DB.

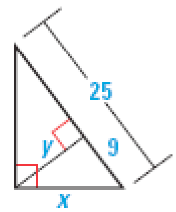
Find the value of each variable.

8.



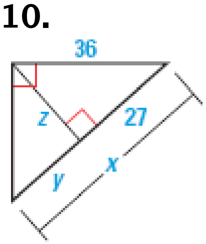
$x = 4, \ y = 3\sqrt{5}$

9.



$x = 15, \ y = 12$

10.



$x = 48$

$y = 21$

$z = 9\sqrt{7}$

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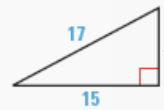
9.2 THE PYTHAGOREAN THEOREM

Examples on pp. 536–537

EXAMPLE You can use the Pythagorean Theorem to find the value of r.
$17^2 = r^2 + 15^2$, or $289 = r^2 + 225$. Then $64 = r^2$, so $r = 8$.

The side lengths 8, 15, and 17 form a Pythagorean triple because they are integers.



The variables r and s represent the lengths of the legs of a right triangle, and t represents the length of the hypotenuse. Find the unknown value. Then tell whether the lengths form a Pythagorean triple.

11. r = 12, s = 16

$t=20$, yes

12. r = 8 & t = 12

$s=4\sqrt{5}$ no

13. s = 16 & t = 34

$r=30$; yes

14. r = 4 & s = 6

$t=2\sqrt{13}$

No.

9.3 THE CONVERSE OF THE PYTHAGOREAN THEOREM

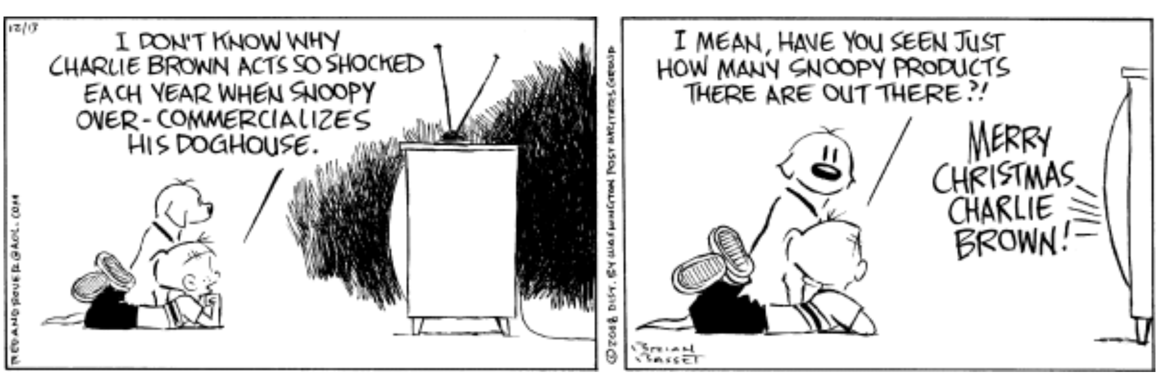
Examples on pp. 543–545

EXAMPLES You can use side lengths to classify a triangle by its angle measures. Let a, b, and c represent the side lengths of a triangle, with c as the length of the longest side.

If $c^2 = a^2 + b^2$, the triangle is a right triangle: $8^2 = (2\sqrt{7})^2 + 6^2$, so $2\sqrt{7}$, 6, and 8 are the side lengths of a right triangle.

If $c^2 < a^2 + b^2$, the triangle is an acute triangle: $12^2 < 8^2 + 9^2$, so 8, 9, and 12 are the side lengths of an acute triangle.

If $c^2 > a^2 + b^2$, the triangle is an obtuse triangle: $8^2 > 5^2 + 6^2$, so 5, 6, and 8 are the side lengths of an obtuse triangle.



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Decide whether the numbers can represent the side lengths of a triangle. If they can, classify the triangle as acute, right, or obtuse.

15. 6, 7 & 10.

yes, obtuse

16. 9, 40, & 41

yes, right

17. 8, 12, & 20

No

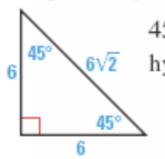
18. $3, 4\sqrt{5}, \& \ 9$

acute

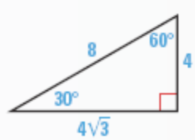
9.4 SPECIAL RIGHT TRIANGLES

Examples on pp. 551–553

EXAMPLES Triangles whose angle measures are 45°-45°-90° or 30°-60°-90° are called *special right triangles.*



45°-45°-90° triangle
hypotenuse = $\sqrt{2}$ • leg



30°-60°-90° triangle
hypotenuse = 2 • shorter leg
longer leg = $\sqrt{3}$ • shorter leg

19. An isosceles right triangle has legs of length $3\sqrt{2}$. Find the length of the hypotenuse.

6

20. A diagonal of a square is 6 inches long. Find its perimeter and its area.

$12\sqrt{2}$

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21. A 30°–60°–90° triangle has a hypotenuse of length 12 inches. What are the lengths of the legs?

6 & $6\sqrt{3}$

22. An equilateral triangle has sides of length 18 centimeters. Find the length of an altitude of the triangle. Then find the area of the triangle.

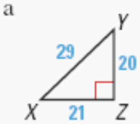
$9\sqrt{3}$ & $81\sqrt{3}$

9.5 TRIGONOMETRIC RATIOS

Examples on pp. 558–561

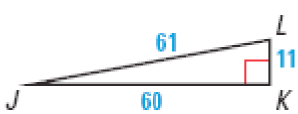
EXAMPLE A trigonometric ratio is a ratio of the lengths of two sides of a right triangle.

$\sin X = \frac{\text{opp.}}{\text{hyp.}} = \frac{20}{29}$ $\quad\cos X = \frac{\text{adj.}}{\text{hyp.}} = \frac{21}{29}$ $\quad\tan X = \frac{\text{opp.}}{\text{adj.}} = \frac{20}{21}$



Find the sine, the cosine, and the tangent of the acute angles of the triangle. Express each value as a decimal rounded to four places.

23.

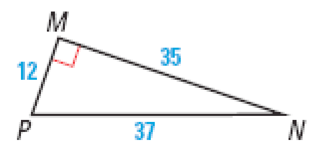


$\sin J = \frac{11}{61}$ $\quad\sin L = \frac{60}{61}$

$\cos J = \frac{60}{61}$ $\quad\cos L = \frac{11}{61}$

$\tan J = \frac{11}{60}$ $\quad\tan L = \frac{60}{11}$

24.



$\sin N = \frac{12}{37}$ $\quad\sin M = \frac{35}{37}$

$\cos N = \frac{35}{37}$ $\quad\cos M = \frac{12}{37}$

$\tan N = \frac{12}{35}$ $\quad\tan M = \frac{35}{12}$

25.

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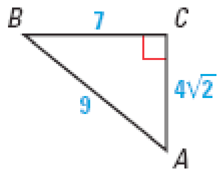


$\sin A = \frac{7}{9}$ $\sin B = \frac{4\sqrt{2}}{9}$

$\cos A = \frac{4\sqrt{2}}{9}$ $\cos B = \frac{7}{9}$

$\tan A = \frac{7}{4\sqrt{2}} = \frac{7\sqrt{2}}{8}$ $\tan B = \frac{4\sqrt{2}}{7}$

9.6 SOLVING RIGHT TRIANGLES

Examples on pp. 568–569

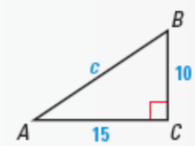
EXAMPLE To solve $\triangle ABC$, begin by using the Pythagorean Theorem to find the length of the hypotenuse.

$c^2 = 10^2 + 15^2 = 325$. So, $c = \sqrt{325} = 5\sqrt{13}$.

Then find $m\angle A$ and $m\angle B$.

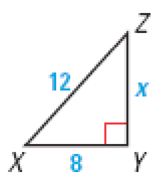
$\tan A = \frac{10}{15} = \frac{2}{3}$. Use a calculator to find that $m\angle A \approx 33.7°$.

Then $m\angle B = 90° - m\angle A \approx 90° - 33.7° = 56.3°$.



Solve the right triangle. Round decimals to the nearest tenth.

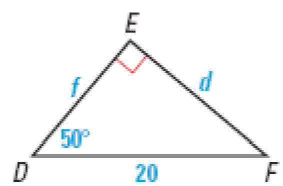
26.



$x = 8.9$ $m\angle X = 48°$

$m\angle Y = 42°$

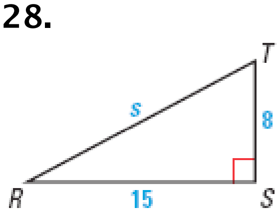
27.



$d = 15.3$ $m\angle F = 40°$

$f = 12.9$

28.



$s = 17$

$m\angle R = 28°$

$m\angle T = 62°$

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9.7 VECTORS

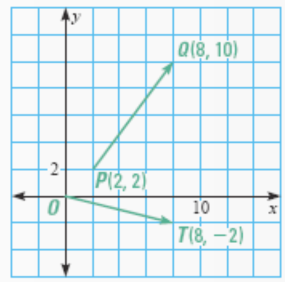
Examples on pp. 573–575

EXAMPLES You can use the Distance Formula to find the magnitude of $\overrightarrow{PQ}$.

$$|\overrightarrow{PQ}| = \sqrt{(8-2)^2 + (10-2)^2} = \sqrt{6^2 + 8^2} = \sqrt{100} = 10$$

To add vectors, find the sum of their horizontal components and the sum of their vertical components.

$$\overrightarrow{PQ} + \overrightarrow{OT} = \langle 6, 8\rangle + \langle 8, -2\rangle = \langle 6+8, 8+(-2)\rangle = \langle 14, 6\rangle$$



Write the component form of the vector and find its magnitude. Round decimals to the nearest tenth.

29. P(2, 3) & Q(1, −1)

$\overrightarrow{PQ} = \langle -1, -4\rangle$

$|\overrightarrow{PQ}| = 4.1$

30. P(−6, 3) & Q(6, −2)

$\overrightarrow{PQ} = \langle 12, -5\rangle$

$|\overrightarrow{PQ}| = 13$

31. P(−2, 0) & Q(1, 2)

$\overrightarrow{PQ} = \langle 3, 2\rangle$

$|\overrightarrow{PQ}| = 3.6$

32. Let $\vec{u} = \langle 1, 2\rangle$ & $\vec{v} = \langle 13, 7\rangle$. Find $\vec{u} + \vec{v}$. Find the magnitude of the sum vector and its direction relative to east.

$\langle 14, 9\rangle$

16.6

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